

EBIO 3080 Week 1 R Tutorial

Silas Tittes

25 August, 2016

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- ▶ I will grade in class, raise your hand when completed.

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- ▶ Plotting data – `plot()` and `hist()`

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- ▶ Use “Control” + “a” to highlight all code, then “Control” + “Enter” to run all code.
- ▶ Use the “tab” key and R will often complete or predict the remaining text. *Very useful!*

Navigating your computer like a pro

To be efficient in R we need to know where we are and where we want to go within our computer.

```
#try using the tab button for  
#suggestions on how to finish your path
```

```
#get working directory  
getwd()
```

```
[1] "/home/silastittes/Documents/TAing/Fall16_Evolution/week1/"
```

```
#set working directory  
setwd("/home/silastittes/Desktop/")  
getwd()
```

```
[1] "/home/silastittes/Desktop"
```

```
setwd("~/Documents/TAing/Fall16_Evolution/week1/")
```

Navigating your computer like a pro

Make sure your files are where you think they are!

```
list.files()
```

```
[1] "Height_Fall2014_v2.csv" "horned_lizards.csv"  
[3] "Week1_RTutorial.pdf"   "Week1_RTutorial.R"  
[5] "Week1_RTutorial.Rmd"
```

Read data from a text file or csv into R

- ▶ Use `read.csv()` to read in a csv file.

```
lizard <- read.csv("horned_lizards.csv", header = TRUE)
```


Read data from a text file or csv into R

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- ▶ Use `read.table()` to read in a txt file.

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Read data from a text file or csv into R

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- ▶ Once you know where yourself and the data files you need are, read data into R.

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- ▶ Expect data to almost always be in csv format for this class.

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- ▶ Always save data to an object, with a meaningful name.

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lizard <- read.csv("horned_lizards.csv", header = TRUE)
```

Read data from a text file or csv into R

- ▶ Use `read.csv()` to read in a csv file.
- ▶ Use `read.table()` to read in a txt file.
- ▶ Once you know where yourself and the data files you need are, read data into R.
- ▶ Expect data to almost always be in csv format for this class.
- ▶ Always save data to an object, with a meaningful name.
- ▶ Let R know the first row of the data set are names for the columns using “`header = TRUE`”

```
lizard <- read.csv("horned_lizards.csv", header = TRUE)
```

Working with data frames

Take a quick look at the data with `head()`, which prints the first six rows by default.

```
head(lizard)
```

	squamosalHornLength	Survival
1	25.2	living
2	26.9	living
3	26.6	living
4	25.6	living
5	25.7	living
6	25.9	living

Working with data frames

Work with individual columns of the data frame with the \$ operator.

```
head(lizard$Survival)
```

```
[1] living living living living living living  
Levels: killed living
```

```
head(lizard$squamosalHornLength)
```

```
[1] 25.2 26.9 26.6 25.6 25.7 25.9
```

Working with data frames

Get rows or columns of the data frame with indexing brackets

```
#first row all columns
```

```
lizard[1,]
```

```
      squamosalHornLength Survival  
1                25.2    living
```

```
#second row first column
```

```
lizard[2,1]
```

```
[1] 26.9
```

```
#last row second column
```

```
lizard[nrow(lizard),2]
```

```
[1] killed
```

```
Levels: killed living
```


Basic math and summary statistics on vectors

- ▶ R likes vectors – 1 x n dimensional sets of values all of the same type.
- ▶ Use the `c()` function to construct a new vectors.

```
#numeric vector
```

```
n <- c(1, 2, 3)
```

```
n
```

```
[1] 1 2 3
```

```
is.vector(n) #if a vector, will print TRUE
```

```
[1] TRUE
```

```
#character vector
```

```
ch <- c("a", "b", "c")
```

```
ch
```

```
[1] "a" "b" "c"
```

Basic math and summary statistics on vectors

Math operators are pretty straight forward.

```
n + n
```

```
[1] 2 4 6
```

```
n * n
```

```
[1] 1 4 9
```

```
n^2
```

```
[1] 1 4 9
```

```
sqrt(n)
```

```
[1] 1.000000 1.414214 1.732051
```

```
log(n)
```

```
[1] 0.0000000 0.6931472 1.0986123
```

Basic math and summary statistics on data frames

#can use this to combine columns of a data frame too!

```
hornlength_twice <- c(lizard$squamosalHornLength,  
                      lizard$squamosalHornLength)
```

```
length(lizard$squamosalHornLength)
```

```
[1] 185
```

```
length(hornlength_twice)
```

```
[1] 370
```

Basic math and summary statistics on data frames

R thinks of columns of a data frame as a vector, so rules for vectors usually apply to columns of a data frame.

#if following, don't write head!

```
head(lizard$squamosalHornLength)
```

```
[1] 25.2 26.9 26.6 25.6 25.7 25.9
```

```
head(lizard$squamosalHornLength * 2)
```

```
[1] 50.4 53.8 53.2 51.2 51.4 51.8
```

Basic math and summary statistics on vectors

R has an immense statistical library

```
mean(lizard$squamosalHornLength) #DOH!
```

```
[1] NA
```

```
mean(lizard$squamosalHornLength, na.rm = TRUE)
```

```
[1] 23.90707
```

```
median(lizard$squamosalHornLength, na.rm = TRUE)
```

```
[1] 24.15
```

```
var(lizard$squamosalHornLength, na.rm = TRUE)
```

```
[1] 7.672136
```

```
sd(lizard$squamosalHornLength, na.rm = TRUE)
```

Plotting data

- ▶ `plot()` requires numeric x value(s) and y value(s) – always pairs, at least one pair.

Plotting data

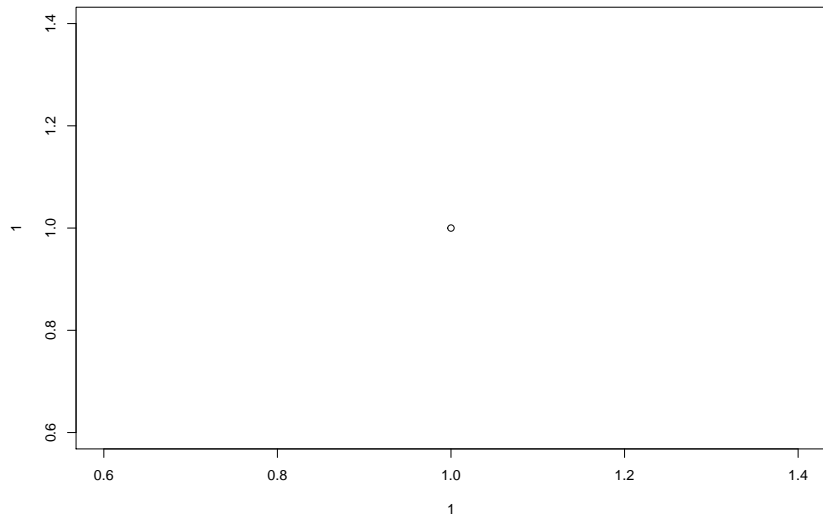
- ▶ `plot()` requires numeric x value(s) and y value(s) – always pairs, at least one pair.
- ▶ `boxplot()` requires (i) a column of numeric values (horn lengths) and (ii) a column of repeated names that categorize the values (dead or alive).

Plotting data

- ▶ `plot()` requires numeric x value(s) and y value(s) – always pairs, at least one pair.
- ▶ `boxplot()` requires (i) a column of numeric values (horn lengths) and (ii) a column of repeated names that categorize the values (dead or alive).
- ▶ `hist()` requires a set of numeric values (column or vector).

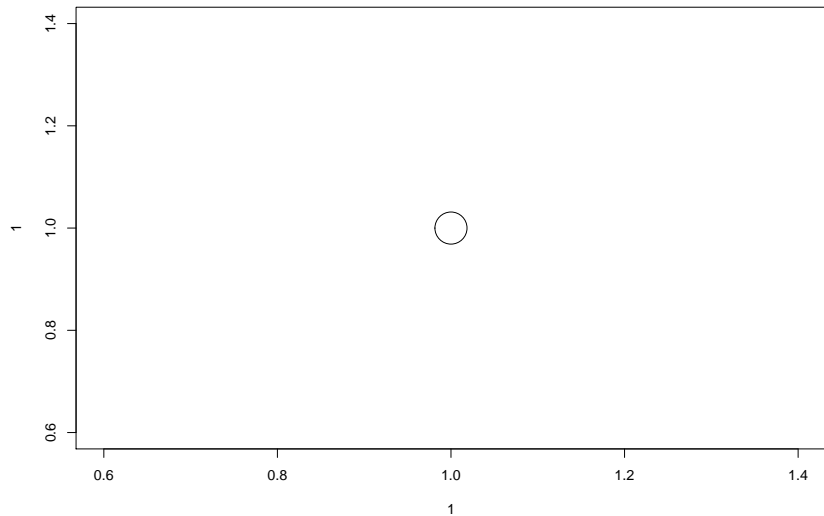
Plotting data

```
plot(1, 1)
```



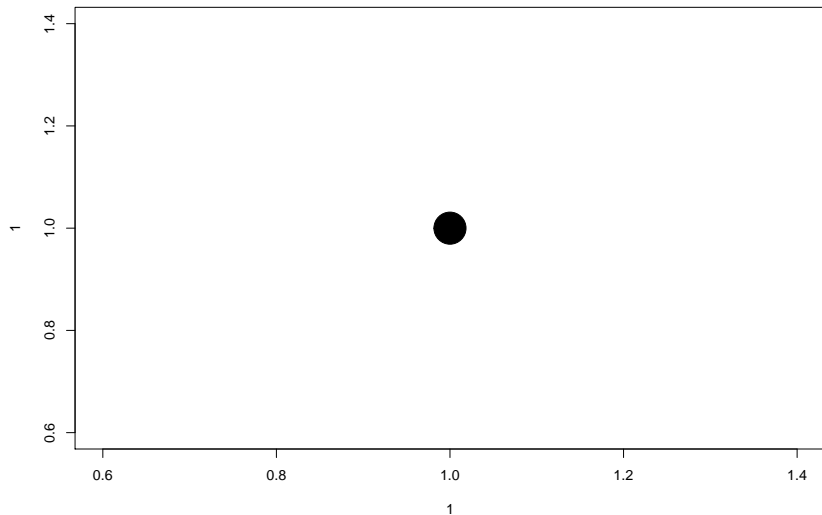
Plotting data

```
plot(1, 1, cex=5)
```



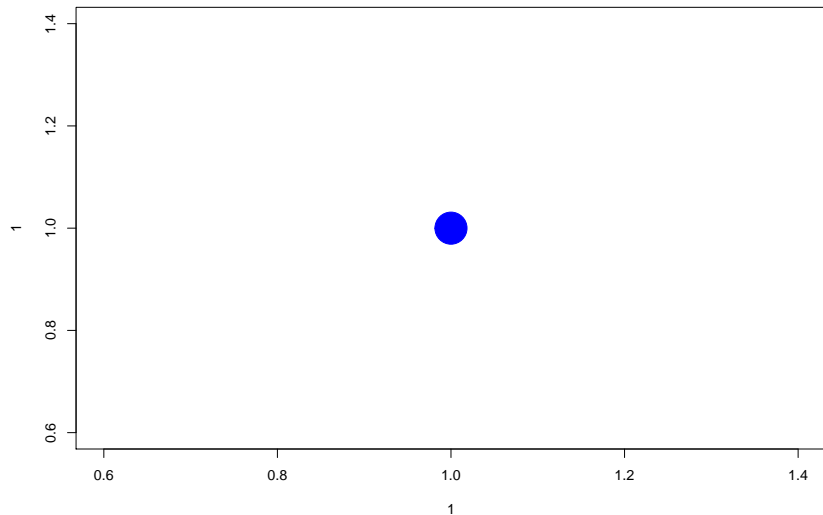
Plotting data

```
plot(x = 1, y = 1, cex=5, pch = 19)
```



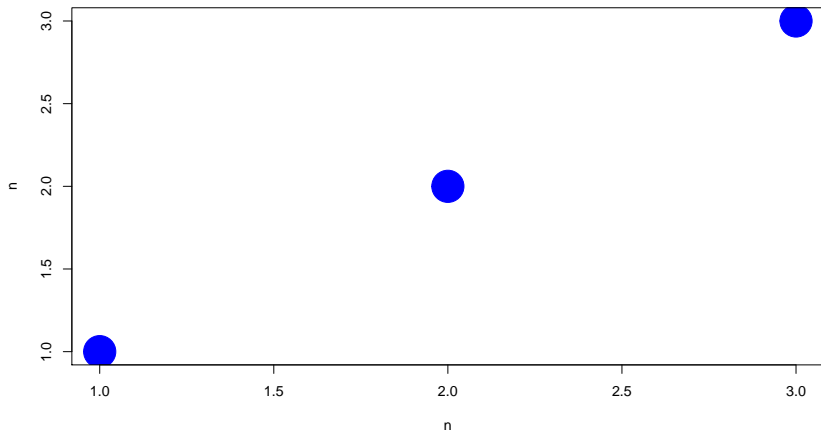
Plotting data

```
plot(1, 1, pch = 19, cex=5, col="blue")
```



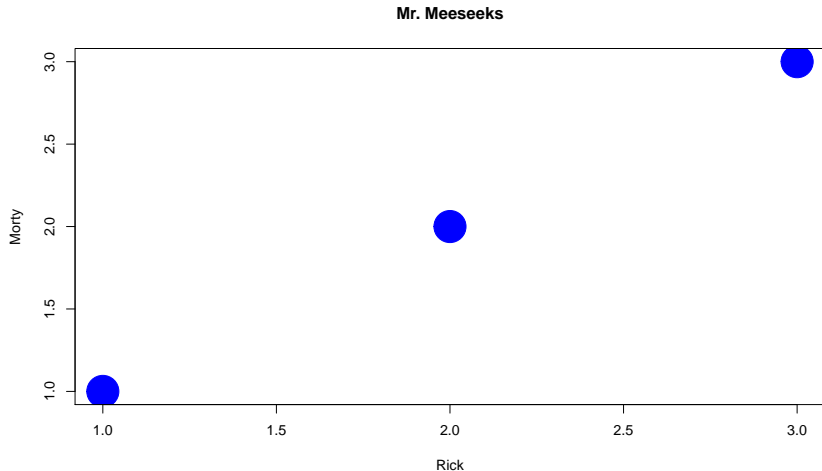
Plotting data

```
n <- c(1,2,3)
plot(x = n, y = n, cex=5, pch = 19, col="blue")
```



Plotting data

```
plot(x = n, y = n, cex=5, pch = 19, col="blue",  
     xlab="Rick", ylab="Morty", main = "Mr. Meeseeks")
```

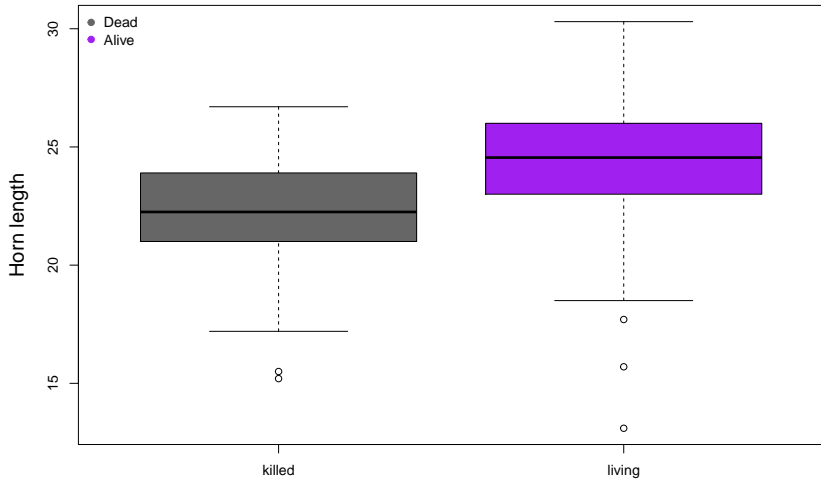


Plotting data

R has incredible graphics utilities

```
boxplot(lizard$squamosalHornLength ~ lizard$Survival,  
        ylab = "Horn length",  
        col=c("grey40", "purple"),  
        cex.lab=1.4)  
  
legend("topleft", c("Dead", "Alive"),  
       pch=19, col=c("grey40", "purple"), bty="n")
```

Plotting data



Plotting data

R also has some incredible graphics utilities

```
#separate data by dead or alive
```

```
***don't do this with the height data!**
```

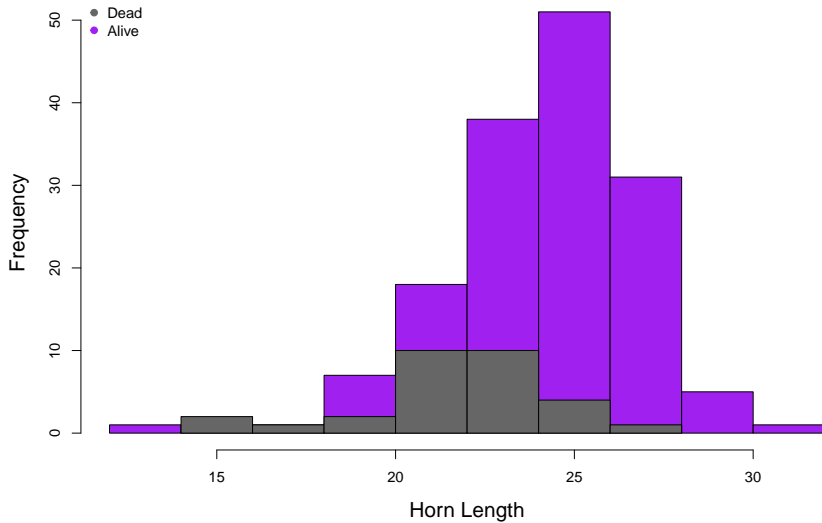
```
dead <- lizard[lizard$Survival == "killed", ]  
alive <- lizard[lizard$Survival != "killed", ]
```

```
rng <- range( c(dead[,1], alive[1,]), na.rm=T)
```

```
hist(alive$squamosalHornLength,  
      xlab = "Horn Length",  
      cex.lab=1.4, cex=0.5, main = "", col = "purple")
```

```
hist(dead$squamosalHornLength, xlim=rng,  
      xlab = "Horn Length",  
      cex.lab=1.4, cex=0.5, main = "", col="grey40", add=T)
```

Plotting data



That's it!

Now complete “Introduction to R” worksheet

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